

Glacial Outwash Process Group



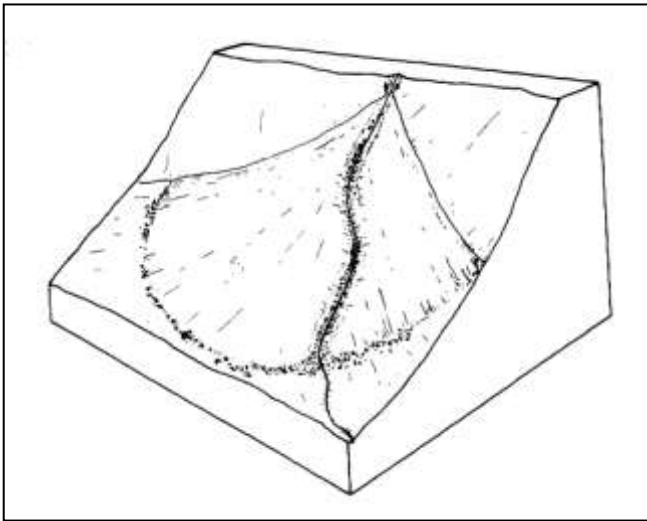
Berner's Bay near Juneau, AK, Lace, Antler and Gilkey Rivers.

Glacial outwash channels are alluvial channels with gradients less than 3 %. Being associated with glaciers these streams carry turbid water with extremely high sediment loads, except for peri-glacial subalpine cirque basin channels. Riparian areas are wide and may extend for more than one thousand meters in large braided outwash plain river systems.

The GO process group includes the following individual channel types:

Channel Type Name	Label	Former Label
Glacial Alluvial Fan Channel	GAF	AF8
Glacial Outwash Estuarine Channel	GES	ES5
Large Braided Glacial Outwash Channel	GOB	GO3
Cirque Channel	GOC	GO5
Large Meandering Glacial Outwash Channel	GOL	GO2
Medium Glacial Outwash Channel	GOM	GO4
Small Glacial Outwash Channel	GOS	n/a
Glacial Outwash Side Channel	GSC	GO1

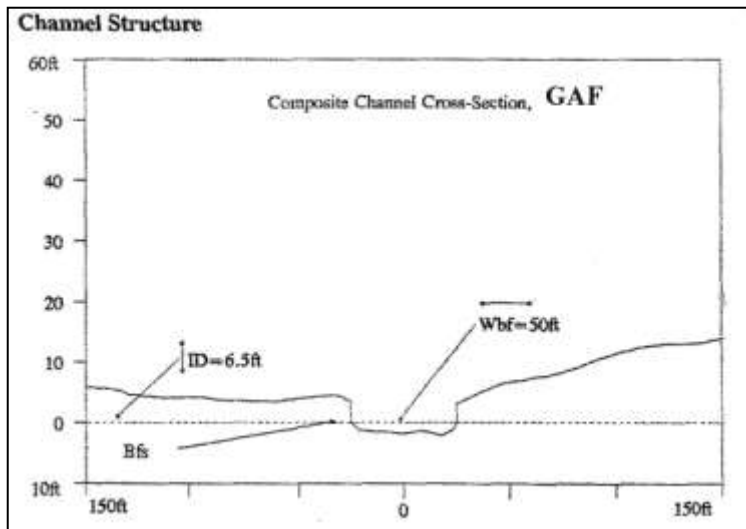
Glacial Alluvial Cone Channel - GAF



Geomorphic Setting:

The GAF occurs on alluvial cone landforms in glacial drainage basins. At least 15 % of the drainage area must be covered by a glacier or permanent snow field to qualify as a GAF.

Channel gradients are commonly greater than 6%. Channel pattern is variable, usually singular at the apex of the cone and branching at the terminus. Suspended glacial silt load is high.



Stream Gradient.....Variable, > 6%, mean = 17%
 Incision Depth.....< or = 2m (6.5ft)
 Bankfull WidthVariable, mean = 15m (50ft)
 Dominant Substrate.....Coarse gravel to small boulder
 Stream Bank CompositionAlluvium
 Sideslope LengthNot significant
 Sideslope Angle.....Not significant
 Channel Pattern.....Single to multiple channel, normally single at the apex of the fan with channel branching at the terminus
 Drainage Basin Area.....2.6 – 13 km² (1-5 mi²)

Plant Association Series	% cover
Non-forest	91%
Mountain Hemlock	3%
Sitka Spruce	3%
Western Hemlock	3%

Riparian Vegetation: The riparian plant community is dominated by non-forested Sitka alder, willow and salmonberry shrub communities.

Channel type phases:

GAFh – Shrub Phase, riparian vegetation consist of brush vegetation.

Management Considerations

Hydrologic Function: GAF channels have high rates of sediment transport and deposition. Sediment is delivered to these channels from alpine glacier runoff, mountainslope avalanche and mass wasting processes. Sediment outwash lobes are deposited across the surface of the alluvial cone by a network of multiple branched channels. Consequently, these are very dynamic landforms.

Indicator Species Rating

MIS	ASA	ARA
Coho	Negligible	Negligible
Pink	Negligible	Negligible
Chum	Low	Negligible
Sockeye	Low	Negligible
Chinook	Negligible	Negligible
Dolly Varden	Low	Low
Steelhead	Negligible	Negligible

Aquatic Habitat Capability

Large Woody Debris.....N/A
 Available Spawning Area (ASA)...Low
 Available Rearing Area (ARA).....Low

GAF channels are often accessible to anadromous fish, and are occasionally accessible to resident fish . The amount of ASA and ARA are insignificant. Substrate

material is generally large, consisting of: 22% gravel, 43% rubble, 31% boulders or bedrock.

Chum salmon and Dolly Varden char may spawn where finer substrate is found at the base of these channels near the junction with mainstem river channels. Shallow groundwater aquifers associated with alluvial cones can significantly improve spawning habitat in adjacent mainstem streams where groundwater upwelling occurs. Where these channels feed accessible lakes, spawning by sockeye salmon and resident species may occur.

Riparian Management Considerations

Stream banks are naturally unstable in GAF channels, and riparian vegetation plays an important role in stabilizing these banks, therefore, maintaining riparian vegetation integrity is an important management concern (BMPS 12.6, 13.16). Large sediment loads from glacial meltwater and snow avalanches cause extensive channel aggradation and frequent channel shifting. Consequently, bridge and culvert design and road maintenance are key riparian management concerns (BMPs 14.17, 14.20).

Management concern for:

Large woody debris	Low
Sediment retention	Mod
Stream bank stability	Low
Sideslope sensitivity	N/A
Flood plain protection need	High
Culvert fish passage	N/A

These channels are designated Stream Class II or III. A minimum 100 foot timber harvest buffer is occasionally required along both banks of these streams (Tongass Timber Reform Act, 1991).

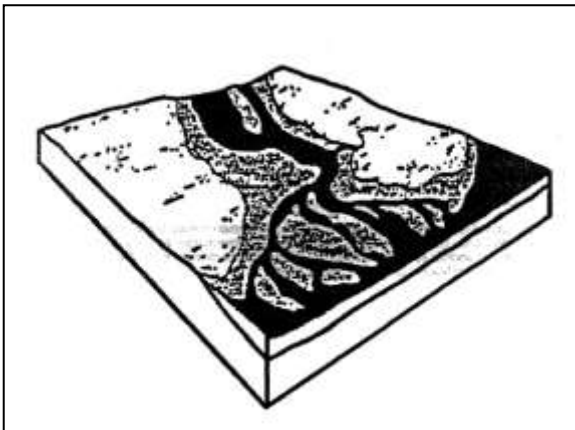
Riparian Management Opportunities

Sport Fish Potential.....N/A

Enhancement Opportunities.....Spawning channels

Spawning channel sites can often be located in the vicinity of glacial alluvial cone channels where suitable gravel substrate and shallow groundwater aquifers often occur. Provision for protecting spawning gravel installation from flooding and sediment deposition should be incorporated into project plans.

Glacial Outwash Estuarine Channel – GES



Geographic Setting: GES channels are associated with large glacial river deltas. Active glaciers and snowfields must cover at least 15% of the contributing watershed area.

Channel Structure

Stream Gradient.....	0.5 to 1.5%
Incision Depth.....	< 2m (6.5ft)
Bankfull Width	Variable, very wide, braided
Dominant Substrate.....	Sand to Coarse gravel
Stream Bank Composition	Glacial Alluvium
Sideslope Length	Not significant, broad flat landform
Sideslope Angle.....	Not significant
Channel Pattern.....	Highly braided
Drainage Basin Area.....	> 52 km ² (20 mi ²)

Riparian Vegetation. The riparian areas immediately adjacent to these channels generally are un-vegetated sand and gravel outwash and extensive tidal mudflats. Salt tolerant grasses and sedges dominate the more stable terraces away from the active deposition zone.

Management Considerations

Hydrologic Function. GES channels are depositional streams, preceded by GOB channels. Therefore characteristics such as braided channels, extensive sediment loads are similar. Substrate material ranges from small cobble to glacial silt, and suspended silt loads are high. Tidal influences may affect stream flow and river stage for long distances upstream from saltwater.

Indicator Species Rating

MIS	ASA	ARA
Coho	Negligible	Negligible
Pink	Negligible	Negligible
Chum	Negligible	Negligible
Sockeye	Negligible	Moderate
Chinook	Negligible	Negligible
Dolly Varden	Negligible	Negligible
Steelhead	Negligible	Negligible

Aquatic Habitat Capability

Large Woody N/A

Available Spawning Area (ASA)...N/A

Available Rearing Area (ARA).....N/A

GES channels are always accessible to anadromous species. Out migrants and returning adults of all anadromous species may make frequent use of these channels for

staging prior to in or out migration. Sockeye use channel margins and slough habitat for summer rearing. Spawning habitat is negligible.

Riparian Management Considerations

These channels are located at the terminus of large glacial rivers, therefore, sediment deposition is extremely high.

Stream bank sensitivity is rated high due to fine textured bank materials and highly variable flood flows. Channel protection (BMP 13.16) and bridge/culvert design (BMP 14.17) are important considerations. Lateral channel migration is extremely active in most GES channels.

Management concern for:	
Large woody debris	Low
Sediment retention	High
Stream bank stability	High
Sideslope sensitivity	N/A
Flood plain protection need	High
Culvert fish passage	High

Riparian areas adjacent to GES segments often have extensive tidal marshes. Protection of these wetland values is an important management concern.

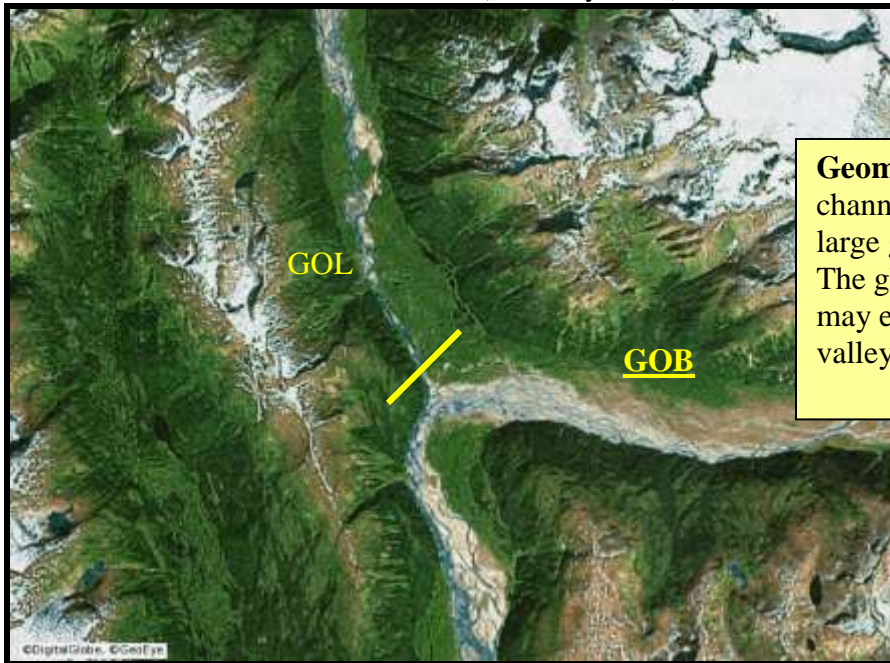
GES channels are designated Stream Class I. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991). Control of inchannel operations is an important riparian management concern for these streams (BMP 14.14).

Riparian Management Opportunities

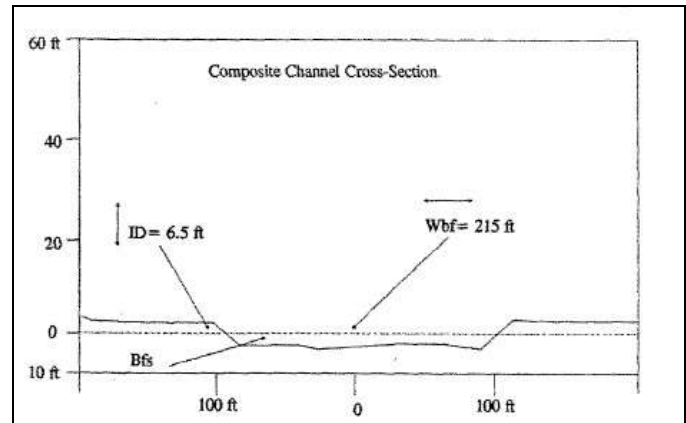
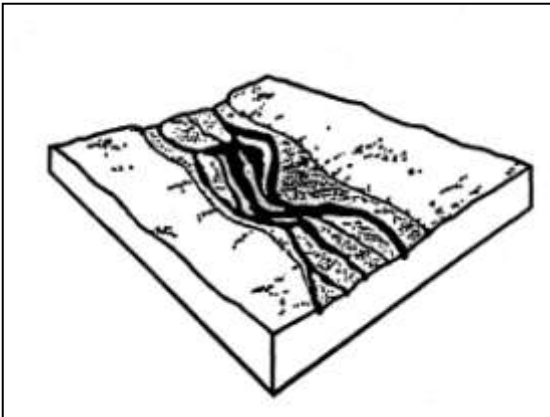
Sport Fish Potential.....Low

Enhancement Opportunities.....N/A.

Large Braided Glacial Outwash Channel - GOB (formerly GO3)



Geomorphic Setting: GOB channels are situated in large glacial watersheds. The glacial outwash plain may extend across the entire valley floor.



Channel Structure

Stream Gradient < 3%, mean = 2%

Incision Depth $\leq 2\text{m}$ (6.5ft)

Bankfull Width -60 to 300, .mean = 65m (215 ft)

Dominant Substrate – Coarse gravel to large cobble

Stream Bank Composition - Alluvium

Sideslope Length/angle – Not significant, broad flat landform

Channel Pattern- braided, anastomosing channel

Drainage Basin Area > 51.8 km² (20mi²)

Riparian Vegetation: The riparian plant communities consist of non-forested Sitka alder and willow shrub communities and the Sitka spruce-cottonwood/alder plant association.

Gilkey River near Berners Bay.



Plant Association Series	% cover
Non-forest	71%
Sitka spruce-cottonwood	16%
Sitka Spruce	7%
Mountain Hemlock	6%

Management Considerations

Hydrologic function: The GOB channels function as sediment deposition systems. These low gradient, uncontained channels have low stream energy and large sediment loads creating a braided channel network with an extensive flood plain. Peak flow events occur during the summer melt period and during the early fall rainy season.

Aquatic Habitat Capability

Large Woody Debris.....900 ft³/1000 linear ft

Available Spawning Area (ASA)...Insufficient data

Available Rearing Area (ARA).....Insufficient data

Indicator Species: GOB channels are accessible to anadromous fish. Typically, they provide migration routes to salmon spawning area in clear water tributaries. Chinook, chum and sockeye salmon use spawning habitat in portions of the main channel. Spawning capability is limited by fine sediment in gravel spawning beds. Sockeye and chum salmon tend to select gravels where upwelling groundwater is present. Primarily sockeye and Chinook utilize rearing areas associated with sloughs, side channel pools, and stream bank habitat. Coho and Dolly Varden char rear in low numbers in these channels

MIS	ASA	ARA
Coho	Moderate	Moderate
Pink	Low	Negligible
Chum	Moderate	Negligible
Sockeye	Moderate	Moderate
Chinook	Moderate	Moderate
Dolly Varden	Low	Low
Steelhead	Negligible	Negligible

Riparian Management Considerations

Large wood accumulations have moderate influence on in-stream habitat in GOB channels. Most stable wood accumulations are located along channel margins, sloughs, or side channels. Pool and bank cover associated with large wood is particularly important for rearing Chinook and sockeye salmon.

Management concern for:	
Large woody	Moderate
Sediment retention	High
Stream bank stability	High
Sideslope sensitivity	N/A
Flood plain protection need	High
Culvert fish passage	N/A

Stream banks are naturally susceptible to erosion . Flood flows are poorly contained. Channel aggradation and scour processes are very active due to the extremely large sediment loads. Riparian management should emphasize stream bank protection (BMPs 13.16, 14.17). Main stem crossings are generally not feasible.

Roads constructed across flood plain tributaries must allow unrestricted fish migration from main stem channels (BMP 14.14)

Stream Class: GOB channels are classified as **Stream Class I**. A minimum 100 foot timber harvest buffer is required along both banks of these channels (Tongass Timber Reform Act, 1991).

Riparian Management Opportunities

Sport Fish Potential.....Low

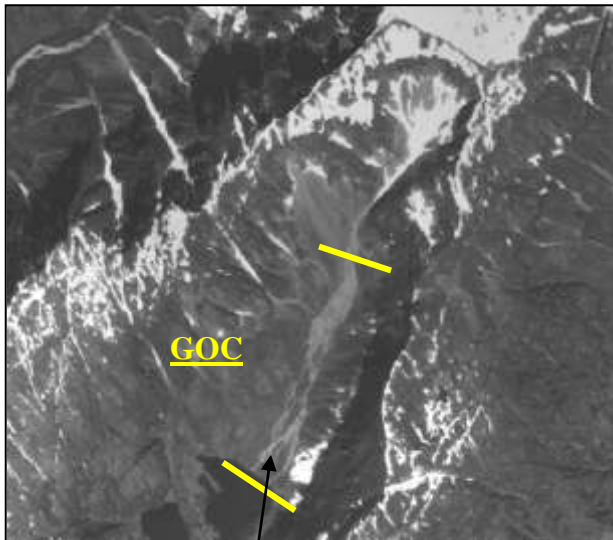
Enhancement Opportunities.....Spawning channels and large wood placement

Sport fishing is limited due to poor accessibility and turbid waters.

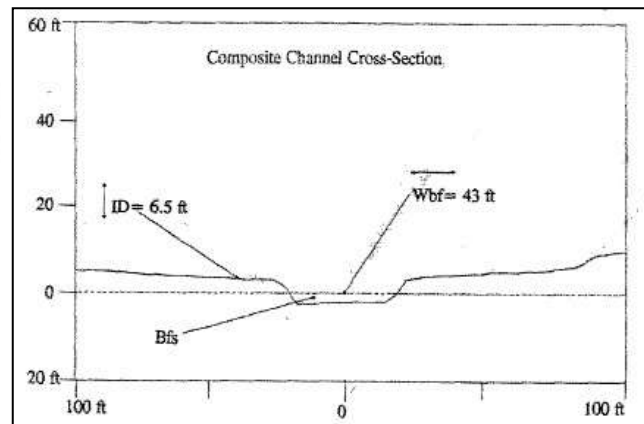
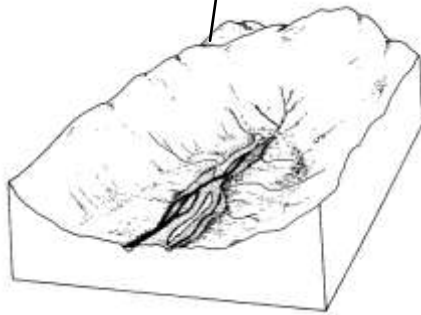
Spawning channels can often be located adjacent to GOB channels. These side channels can provide spawning gravel and shallow ground water flow. Project plans for spawning channel installations should include protections from major flooding events.

Large wood structures can be used to improve limited in-channel rearing habitat. However, local sources of suitable large wood pieces are often lacking.

Cirque Channel – GOC (formerly GO5)



Geomorphic Setting:
GOC channels occur in alpine cirque basins, hanging valleys or the upper headwater catchments. Runoff is derived from the melt water discharge of a mountain glacier or perennial snow fields. Adjacent valley sideslopes are usually steep and avalanche prone.



Channel Structure

Stream Gradient.....	< 6%
Incision Depth.....	< or = 2m (6.5ft)
Bankfull Width	Variable, mean 13m (43 ft)
Dominant Substrate.....	Variable, broad range of material, from bedrock to silt
Stream Bank Composition	Alluvium or colluvium
Sideslope Length	Not significant, broad flat landform
Sideslope Angle.....	Not significant
Channel Pattern.....	Single to braided, most commonly single at higher gradient upper end and braided at lower gradient downstream end.
Drainage Basin Area.....	< 13 km ² (5mi ²)

Riparian Vegetation: The riparian plant community is dominated by non-forested alpine meadow, Sitka alder and willow plant communities, with mountain hemlock/cassiope as the dominant forest plant association.

Plant Association Series	% cover
Non-forest	88%
Mountain Hemlock	12%

Management Considerations

Hydrologic Function: GOC channels have moderate stream energy and relatively large sediment loads. Some deposition of gravel and sand occurs at the low gradient terminus of the channel. Large clast substrate may result from mass wasting processes on adjacent steep mountain slopes. Poorly contained channel segments typically have a braided channel pattern.

Aquatic Habitat Capability

Large Woody Debris.....N/A

Available Spawning Area (ASA)...Low

Available Rearing Area (ARA).....Low

These channels are generally inaccessible to anadromous and resident species due to downstream barriers. Fish use is insignificant.

Riparian Management Considerations

These streams temporarily retain sediment delivered from snow avalanche and mountain glacier runoff.

Stream banks are composed of unconsolidated colluvial and alluvial sediments. Lateral channel migration and stream braiding is common in GOC channels. Stream channel disturbances can accelerate natural stream bank instability (BMPs 12.7, 14.14, 14.17)

Management concern for:	
Large woody debris	N/A
Sediment retention	Moderate
Stream bank stability	Moderate
Sideslope sensitivity	Low
Flood plain protection need	Low
Culvert fish passage	N/A

GOCs are designated **Stream Class III**.

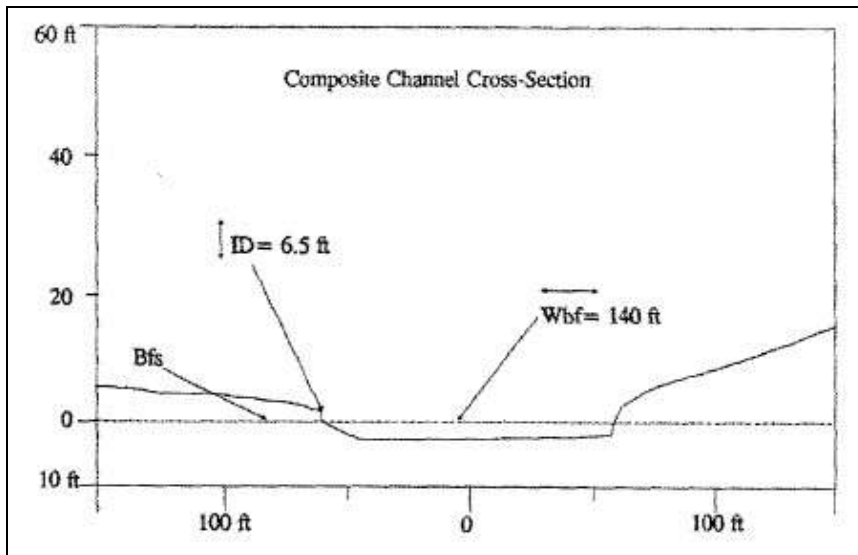
Large Meandering Glacial Outwash Channel – GOL



Beasley Creek, Yakutat

Geomorphic Setting: GOL channels occur in middle to lower valley positions in large glacial basins. Valleys are u-shaped, with large, discontinuous flood terraces adjacent landform in broad valley bottom areas, but inclusions of lowland and hill landforms can occur. These channels are often found at the outlet of glacial lakes.

Channel Structure



Stream Gradient..... < 3%, mean = 2%

Incision Depth..... < or = 4m (13ft), mean = 2m (6.5ft)

Bankfull Width Variable, mean 42m (140 ft)

Dominant Substrate..... Coarse gravel to small boulder

Stream Bank Composition Alluvium

Sideslope Length Not significant, except in glacial moraine deposits

Sideslope Angle..... Not significant

Channel Pattern..... Single sinuous

Drainage Basin Area..... > 52 km² (20mi²)

Plant Association Series	% cover
Non-forest	57%
Mountain Hemlock	11%
Sitka Spruce-Cottonwood	11%
Sitka Spruce	10%
Western Hemlock	3%

Riparian Vegetation: The riparian plant community is dominated by non-forested Sitka alder, willow and salmonberry plant communities, which occur adjacent to the stream 64 % of the time. Mountain hemlock series and Sitka spruce-cottonwood series are the predominant forest communities.

Management Considerations

Hydrologic Function: GOL streams are transport channels that carry high sediment loads. They are more sediment transport oriented than other channel types in the Glacial Outwash Process Group. These are moderate energy streams due to flow containment and a mean gradient of 2%. Large woody debris accumulations are moderately frequent features that help to retain bedload sediment.

Aquatic Habitat Capability

Large Woody Debris.....3500ft³/1000 linear ft (100m³/300m)

Available Spawning Area (ASA)...Insufficient data

Available Rearing Area (ARA).....Insufficient data

Indicator Species Ratings

MIS	ASA	ARA
Coho	Low	Low
Pink	Negligible	Negligible
Chum	Moderate	Negligible
Sockeye	Moderate	Low
Chinook	Moderate	Moderate
Dolly Varden	Low	Low
Steelhead	Negligible	Negligible

GOL channels are usually accessible to anadromous species. Because the substrate consists of large material (20% gravel, 52% cobble, 18% boulder), ASA is generally low. Spawning Chinook and chum salmon use these channels in moderate amounts, as do sockeye salmon when lakes or side sloughs are present in the watershed. Rearing Chinook

salmon and Dolly Varden char make use of the minimal ARA (3%) consisting of pools (3% of active channel) having a mean depth of 0.24 m (0.8ft). Because of the shallowness of pools, these channels probably do provide critical overwintering habitat. Coho salmon rear in clear water, off-channel and side channel areas that flow into GOL channels.

Riparian Management Considerations

The influence of large woody debris on channel stability and fish productivity in GOL channels is moderate. Stable in-channel debris generally consists of trees anchored to stream banks or large debris jams at meanders. Most of the limited rearing habitat is keyed to this large woody debris. Maintenance of large woody debris is therefore a key riparian management concern (BMP 12.6).

Management concern for:	
Large woody debris	Moderate
Sediment retention	Moderate
Stream bank stability	Moderate
Sideslope sensitivity	Low
Flood plain protection need	Moderate
Culvert fish passage	N/A

Stream banks in GOL channels are moderately susceptible to erosion. They are composed of unconsolidated alluvium, therefore, the banks are easily undermined by high velocity currents. These channel stability concerns should be considered when locating and designing stream crossings (BMPs 14.2, 14.3). Bridge abutments can accelerate bank erosion when GOL channels are constricted (BMP 14.17). Riparian vegetation is integral in maintaining bank stability and the protection of sensitive alluvial soils in GOL channels (BMP 13.8).

Riparian areas associated with GOL channel segments are generally less than 61 meters (200ft) wide. Flood plain side channels and sloughs, though infrequent, are often very important fish rearing areas. Management activities should maintain flood plain values and functions (BMPs 12.6, 13.16, 14.14)

Stream Class: GOLs are designated **Stream Class I**. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991).

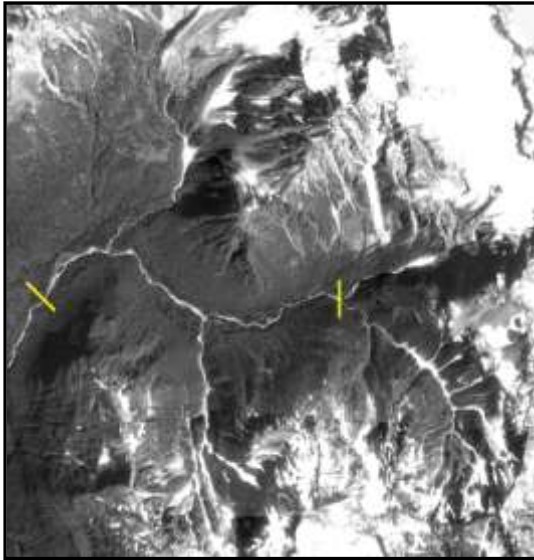
Riparian Management Opportunities

Sport Fish Potential.....Low

Enhancement Opportunities.....Beaver introduction

Encourage introduction and management of beaver populations to increase habitat associated with side channels and sloughs.

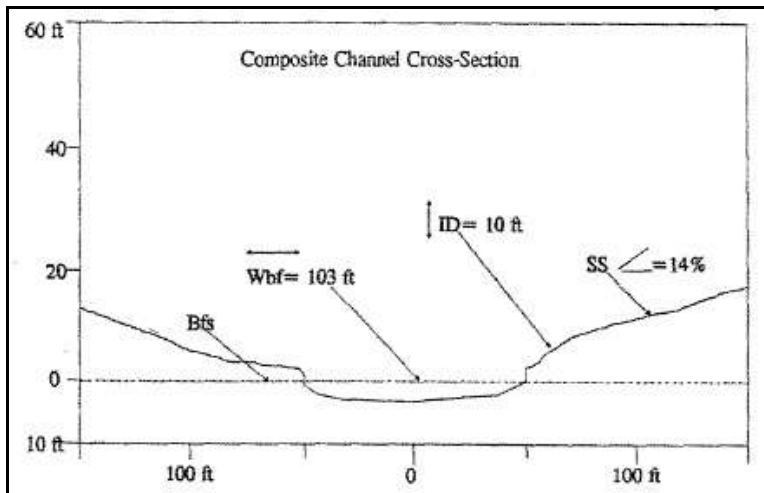
Medium Glacial Outwash Channel – GOM



Near Mt Pinta, Yakutat

Geomorphic Setting: GOM channels occur in the mid to upper valley position in glacial watersheds. Adjacent flood terrace areas are primarily composed of glacial outwash or till. Large valley glaciers and snowfields occur upstream of the GOM channel. Snow avalanche cones and subalpine mountainslopes typically lie adjacent to GOMs.

Channel Structure



Stream Gradient.....	2-6%, mean = 4%
Incision Depth.....	< or = 4m (13ft), mean = 3m (10ft)
Bankfull Width	Variable, mean 31m (103 ft)
Dominant Substrate.....	Coarse gravel to small boulder
Stream Bank Composition	Alluvium or mixed
Sideslope Length	Variable length
Sideslope Angle.....	Mean = 14%
Channel Pattern.....	Single or multiple
Drainage Basin Area.....	13- 52 km ² (5-20mi ²)

Plant Association Series	% cover
Non-forest	77%
Mountain Hemlock	7%
Sitka Spruce-Cottonwood	6%
Sitka Spruce	5%
Western Hemlock	5%

Riparian Vegetation: The riparian area is dominated by non-forested alder, willow shrub communities.

Management Considerations

Hydrologic Function: GOM channels are moderate energy streams that transport large sediment loads. Moderate gradient and large size substrate material are indicative of moderate stream power. Some in-channel retention of fine gravels and sand may occur. Bedload transport is predominantly coarse gravel and cobble particle fractions. Peak flows occur in the spring/summer melt period and in the early fall. A high suspended glacial silt load is also characteristic of GOM channels.

Aquatic Habitat Capability

Large Woody Debris..... < 500ft³/1000 linear ft (14m³/300m)

Available Spawning Area (ASA)...Average = 5% for 12 sites

Available Rearing Area (ARA)..... Average = 5% for 12 sites

Indicator Species Ratings

MIS	ASA	ARA
Coho	Low	Low
Pink	Negligible	Negligible
Chum	Low	Negligible
Sockeye	Low	Negligible
Chinook	Low	Low
Dolly Varden	Moderate	Moderate
Steelhead	Negligible	Negligible

Downstream barriers frequently make GOM channels inaccessible to anadromous species. Typically, they get little use from spawning salmon. Rearing coho and chinook juveniles also infrequently use the available rearing area. Dolly Varden char may spawn in the cobble and gravel substrate (39% and 19% respectively) and rear in side channel pool,

and the occasional pool associated with large woody debris. These channels provide little over-wintering habitat.

Riparian Management Considerations

Retention of fine gravel and sand is moderate to low. Moderate gradient contribute to good flushing of fine bedload sediments.

Stream bank sensitivity is moderate for GOM channels. Bank composition is dominantly poorly sorted alluvium that is readily eroded by high velocity flows. High sediment loads in GOM channels result in naturally high rates of channel aggradation and scouring.

Management concern for:	
Large woody debris	Low
Sediment retention	Moderate
Stream bank stability	Moderate
Sideslope sensitivity	Low
Flood plain protection need	Moderate
Culvert fish passage	Low

Flood plain riparian vegetation contributes greatly to channel stability and reduces channel erosion during flood events. Riparian management should emphasize protection of sensitive channels (BMPs 13.16, 14.17) and alluvial soils (BMPs 12.6).

GOM channels are designated Stream Class I. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991).

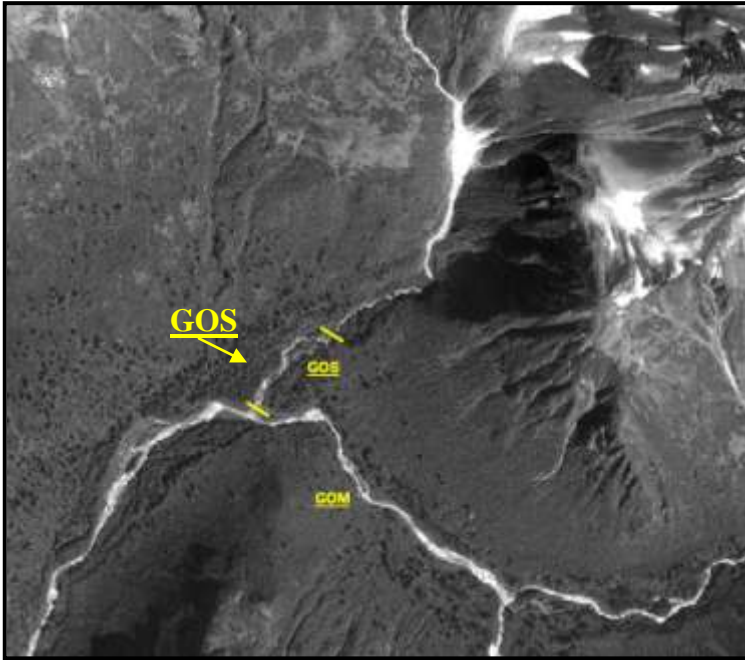
Riparian Management Opportunities

Sport Fish Potential.....Low

Enhancement Opportunities.....Large wood placement and spawning channels

There may be limited opportunities for developing spawning channels adjacent to GOM channels. In addition, if sources of large wood are available, large wood structures can be used to improve limited rearing habitat.

Small Glacial Outwash Channel – GOS



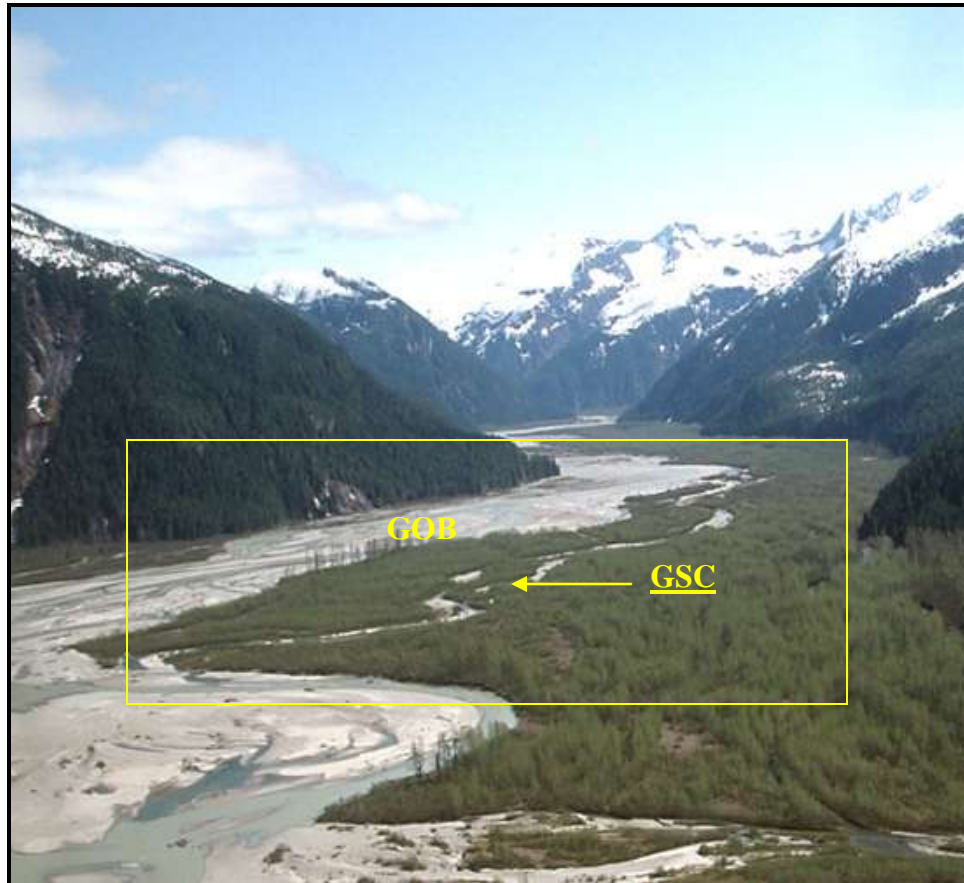
Geomorphic Setting: GOS channels occur in the mid to upper valley position in glacial watersheds. Adjacent flood terrace areas are primarily composed of glacial outwash or till. Valley glaciers and snowfields occur upstream of the GOS channel. Snow avalanche cones and subalpine mountainslopes typically lie adjacent to GOS channels.

GOS - bankfull width is less than 20m.

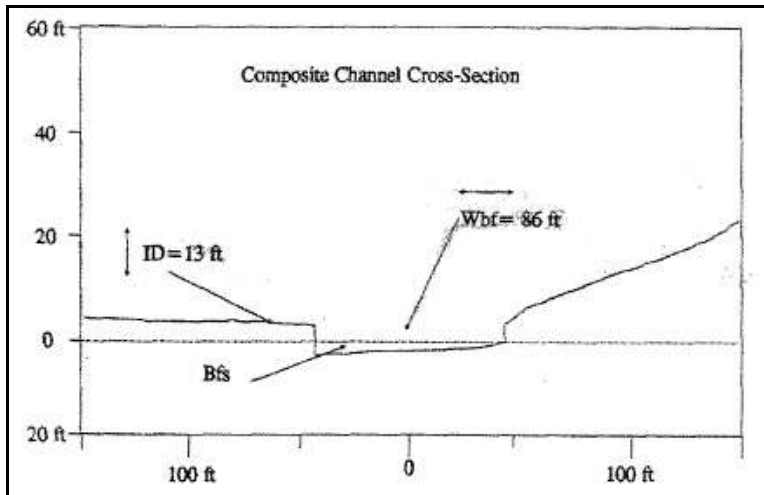
See the GOM description for the riparian vegetation, aquatic habitat capacity and management considerations..

Currently no in-channel photograph available.

Glacial Outwash Flood Plain Side Channel – GSC



Geomorphic Setting: The GSC channel is situated within broad glacial valleys or foreland landforms. Typically it is separated from the mainstem by a heavily vegetated terrace. The GSC segment length must equal or exceed the mainstem channel width to qualify.



Stream Gradient..... 0-1%, mean = 1 %
 Incision Depth..... 0 - 4m (13ft)
 Bankfull Width Variable, 10-200m, mean = 26m (85ft)
 Dominant Substrate..... Sand to Coarse gravel
 Stream Bank Composition Silt, sand, gravel Alluvium
 Sideslope Length Not significant, except in glacial moraine deposits
 Sideslope Angle..... Not significant, except in glacial moraine deposits
 Channel Pattern..... Single or multiple, sinuous
 Drainage Basin Area..... N/A

Plant Association Series	% cover
Non-forest	73%
Sitka Spruce	20%
Sitka Spruce-Cottonwood	7%

Riparian Vegetation: The riparian area is s dominated by non-forested alder, willow shrub and cottonwood plant communities. The Sitka Spruce series is also a significant riparian vegetation component.

Management Considerations

Hydrologic Function: GSC channels function both as sediment transport and storage systems. Low gradient, contained channels with high flow volumes have moderate stream energy. Sloughing of the fine textured stream banks is common. GSC inlets and outlets are normally connected to larger glacial outwash channels (GOL), therefore, flow velocity and stage are controlled by the mainstem river.

Aquatic Habitat Capability

Large Woody Insufficient data
 Available Spawning Area (ASA)... Insufficient data
 Available Rearing Area (ARA)..... Insufficient data

Indicator Species Ratings

MIS	ASA	ARA
Coho	Moderate	High
Pink	Negligible	Negligible
Chum	Moderate	Negligible
Sockeye	Moderate	Moderate
Chinook	Moderate	Moderate
Dolly Varden	Low	Low
Steelhead	Negligible	Negligible

These channels are associated with the GOL large glacial riverine systems and are generally accessible to anadromous fish. ASA decreases and ARA increases as the GSC channel departs from the mainstem glacial channel. Flow velocities decrease and the number of side channel pools increase as distance from the junction with the mainstem increases. Chinook and chum salmon will

spawn in moderate densities where stream velocity and substrate are adequate, and in areas where groundwater upwelling occurs. Chinook salmon juveniles will frequently rear in these channels, and rearing coho will occasionally use stream bank habitat with shrub cover. Sockeye salmon will spawn and rear where side channel pools are large or backwater sloughs are nearby. Dolly Varden char will also occasionally spawn and rear in GSC channels.

Riparian Management Considerations

Although natural sources of inchannel large woody debris are generally low in GSC channels, stable debris accumulations are key habitat features for rearing Chinook salmon and, to some extent, coho.

Management concern for:	
Large woody debris	Moderate
Sediment retention	Moderate
Stream bank stability	High
Sideslope sensitivity	N/A
Flood plain protection need	High
Culvert fish passage	High

Stream banks are commonly composed of fines (sand, silt) and loosely consolidated alluvium. Riparian shrub and forest vegetation is a very important factor for maintaining stream bank stability in GSC channels. Maintenance of stream bank sensitivity is an important management concern (BMPs 12.7, 13.16).

These streams are usually one component of very extensive glacial flood plain complexes. Adjacent sloughs, small tributaries, beaver ponds, and wetlands are important fish and wildlife habitats. Protection of these flood plain and wetland values is a primary management concern (BMPs 12.4-12.6, 13.8, 13.16, 14.14)

GSC channels provide refuge habitat for juvenile salmonids. Therefore, maintenance of unrestricted upstream migration through drainage structures is a key management concern (BMP 14.17).

Stream Class: GSC channels are classified as **Stream Class I**. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991).

Riparian Management Opportunities

Sport Fish Potential.....Low

Enhancement Opportunities.....Beaver introduction

Encourage and manage beaver colonization to maximize fish rearing capability.

